Disney

5B

SCIENCE in COMICS

Cities of Tomorrow

THE CASE OF THE SUSTAINABLE FUTURE

Disney COMICS

Disney **Science in Comics** is a series of comics titles designed to build a sound knowledge base for kids 8–12 years old, on science themes related to features and secrets of the world around us.

In this fast-changing world, the future of cities will greatly impact the future of life on Earth. Science and Technologies can help developing sustainable cities able to meet the social, economic, and environmental goals of the United Nations 2030 Agenda for Sustainable Development. This book shows you how.

CITIES OF TOMORROW: *THE CASE OF THE SUSTAINABLE FUTURE*

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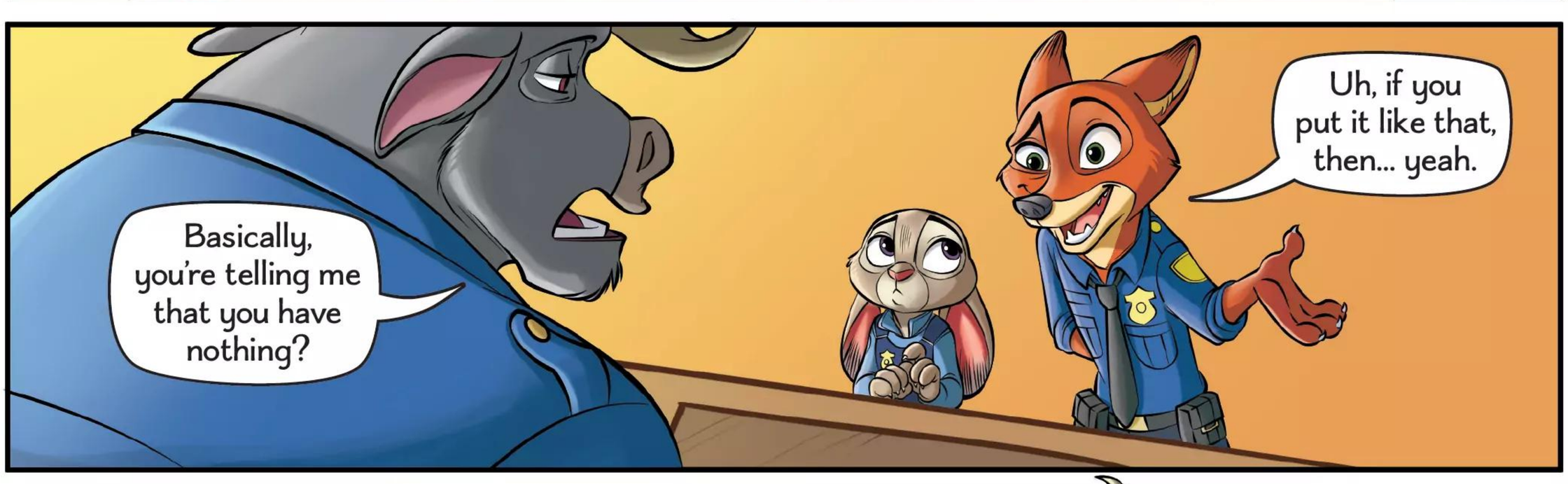
SUSPICIONS

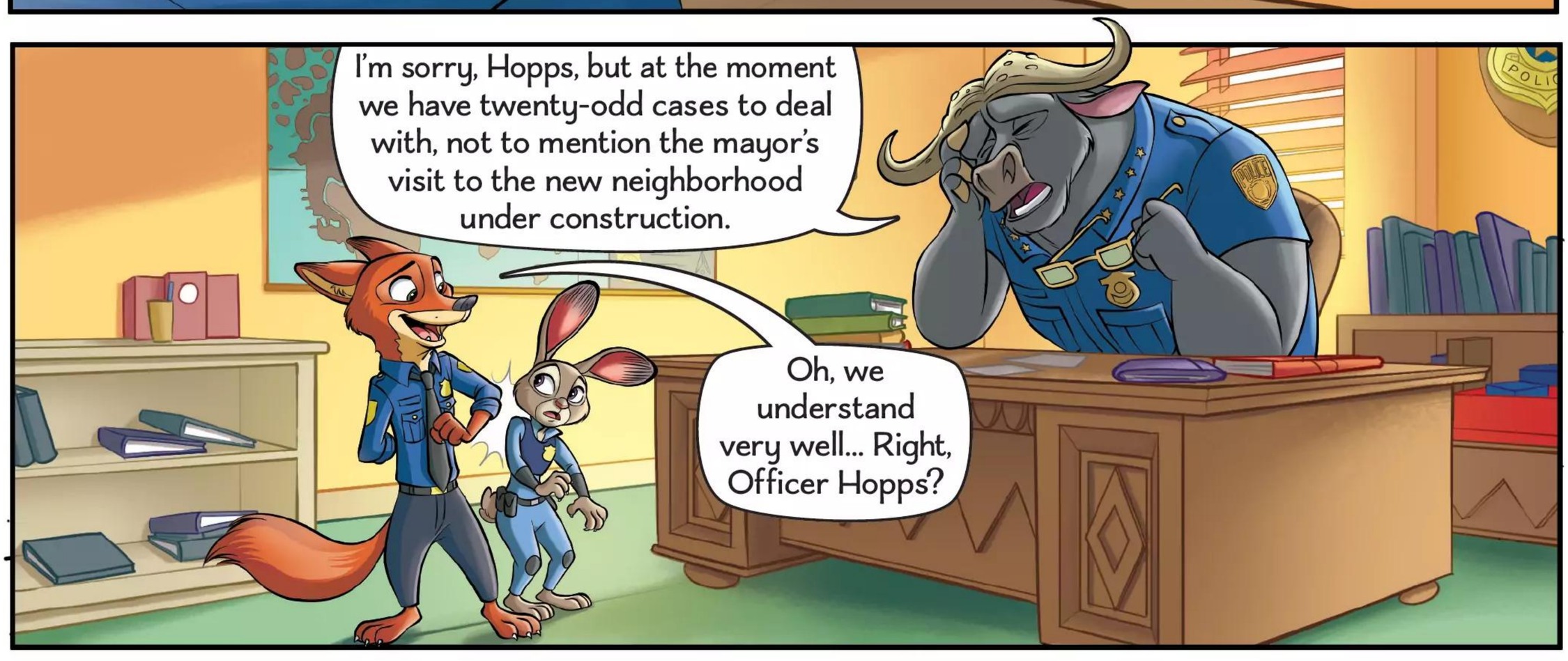
POLICE

Illegal dumping of toxic waste by unknown persons, you say?

And... do you have any evidence of that?

Well, as a matter of fact...
We recovered a bottle that, once analyzed, could have been a lead. But then, uh...
CHIEF BOGO
It got pulverized!


Basically, you're telling me that you have nothing?
Uh, if you put it like that, then... yeah.


I'm sorry, Hopps, but at the moment we have twenty-odd cases to deal with, not to mention the mayor's visit to the new neighborhood under construction.
Oh, we understand very well... Right, Officer Hopps?

Not to mention that Bunnyburrow is outside the ZPD's jurisdiction!

But, sir, what if that waste actually **came** from Zootopia?

Hmph! In that case it would be different... but so far, you've got nothing, and your **usual job** awaits you!

CHIEF BOGO

But...

Let's go, Carrots! **Traffic duty** calls!

Why didn't you try to support me? I thought we agreed on the importance of the case!

Gee, Carrots, what could I have said? You know as well as I do that without proof we got **nothing**!

POLICE

But I thought at least I had **someone on my side!**

Hey, hey. Of course I'm on your side, Judy! It's just that... maybe first we need to...

We need to **check the traffic!** Apparently, that's all we're good for, right?

And I'll do the driving!

VRRRMMM

Later that day...

Judy, stop here!

Why here?

Erm... Uh... I'm really thirsty, and since there's a **public drink dispenser** just nearby...

POLICE

Wait here. It'll just be a sec!

Hmmm...

There's something he's not telling me.

I wonder what game he's playing... OH!

Nick's talking to **Finnick**, his old hustle partner!

JUICE

I see you've got a new scheme here, huh?

You'd better believe it!

This type of dispenser is designed to **limit widespread use** of plastic and glass... no bottles, everyone just helps themselves from the tap!

So I come here, fill bottle after bottle with fruit juice and soft drinks at ridiculously low prices, and then sell them for high fees downtown!

Hmmm, I see you haven't changed a bit!

Hey, not everyone changes their life completely overnight, **Officer Wilde!**

Guess you're right! See you around, Finn!

Did they meet by chance, or...

... or could he be **slipping back into his old ways?**

No, I can't believe it!

I'm back! Nothing better than a full bottle of **blueberry juice** to get you through the rest of the day, huh?

If you say so...

Shortly after, on **Sustainable Street...**

Erm, Carrots, can you stop a sec?

Again?! What is it this time?

I just wanted, uh, to admire the new "**green**"* **buildings** built by the new mayor!

Since when are you interested in buildings? When I first met you, you were living under a bridge!

*Green: this word is often used to mean "environmentally friendly".

Yes, well, a bridge is the kind of home that makes you appreciate innovatively constructed buildings, built to reduce **their environmental impact!**

You call them innovative? They look like a step back in time to me!

There are **bamboo, straw,** and even **earth** buildings here! It's anything but progress: we seem to have regressed to **wild animals!**

You're wrong, Carrots! **Bamboo**, a fast-growing invasive plant, is one of the most **environmentally friendly, economical, and durable** building materials there is!

Straw compressed into blocks is another organic construction material. It's highly **breathable**, meaning it ensures a continuous supply of fresh air, preventing damp in the house!

Like bamboo and straw, **raw earth**–that is, clay left to dry in the sun–also has very little impact on the environment. It's an abundant resource, it isn't processed with chemicals, it doesn't produce polluting waste...

And finally, it can always be returned to nature one day. What's more ecological than that?

I didn't take you for a **green building** expert.

What can I tell you? Living under a bridge makes you kind of **environmentally aware!**

Hmm. At least there's still one **normal** building: that one there!

Oh, it only looks normal, dear!

The walls of the house are lined with an organic and economical material that **doesn't pollute: wool!**

It's an excellent natural insulator, both against the cold and against the heat. And it's all **locally sourced**, because **we** produce it!

Looks like the mayor is trying to change the city for the better, Nick!

NICK?!

What's up with him today?

So you thought you'd sneak off, did you? But...

Gulp!

It's that lowlife **Weaselton**. And for a change, he's stealing strawberries from this **farmscraper's** cultivated wall!

And Nick seems to be **in cahoots with him!** Then he **really** has gone back to hustling!

You got the wrong impression, buddy! I'm just... erm... checking that the **hydroponic irrigation** of the hanging plants is working properly!

I wouldn't play games if I were you, "buddy."

POLICE

Remember what happened **last time?**

Gulp! **OKAY!**

You better tell me what I want to know... and quick.

What's the story here, Nick? Are you betraying your oath to serve the law?

Huh? Me?

Don't try to deny it!

I saw you **plotting** together with those two lowlifes!

Whoa, that's harsh! Is that what you think of me?

You're **burrowing down the wrong hole**, Judy! I'm asking around... to try to track down the identity of the dump truck drivers!

Really? But... **why** didn't you tell me?

I'm sorry I kept all of this from you, but...

Since Bogo didn't approve an investigation, I didn't want to involve you and get you into trouble! Not until I found some reliable leads!

You mean... **you were protecting me?**

Ohhh, Nick!

I was accusing you of falling back into your old life... But I was the one who'd fallen back into **past prejudices!**

Oh, I'm such a **dumb bunny!**

Wait until you find out what your **sly fox partner** has discovered!

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SUSTAINABLE ARCHITECTURE

- A new way of designing
- Passive strategies
- Local and natural
- The importance of soil

A new way of designing

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Building a house with materials widely available on site is an example of sustainable construction.

WHAT IS SUSTAINABLE ARCHITECTURE?

Most of the time when constructing a building, such as a house or a shopping mall, resources are used up and pollution is released into the environment. In order to reduce this negative impact, the practice of **sustainable architecture** has been developed. Sustainable architecture is about designing buildings that respect the planet and its inhabitants. One of the most important aspects is to allow people to **live well** in their homes, with clean air inside and a balanced temperature maintained. The building is also constructed in **harmony with the landscape**, using local materials as much as possible, reducing transportation, use of energy, and consequently pollution, as well as without harming animals and plants in the area. Finally, only **materials that are easy recyclable** are used so that if the building is demolished they can be sustainably disposed of or reused.

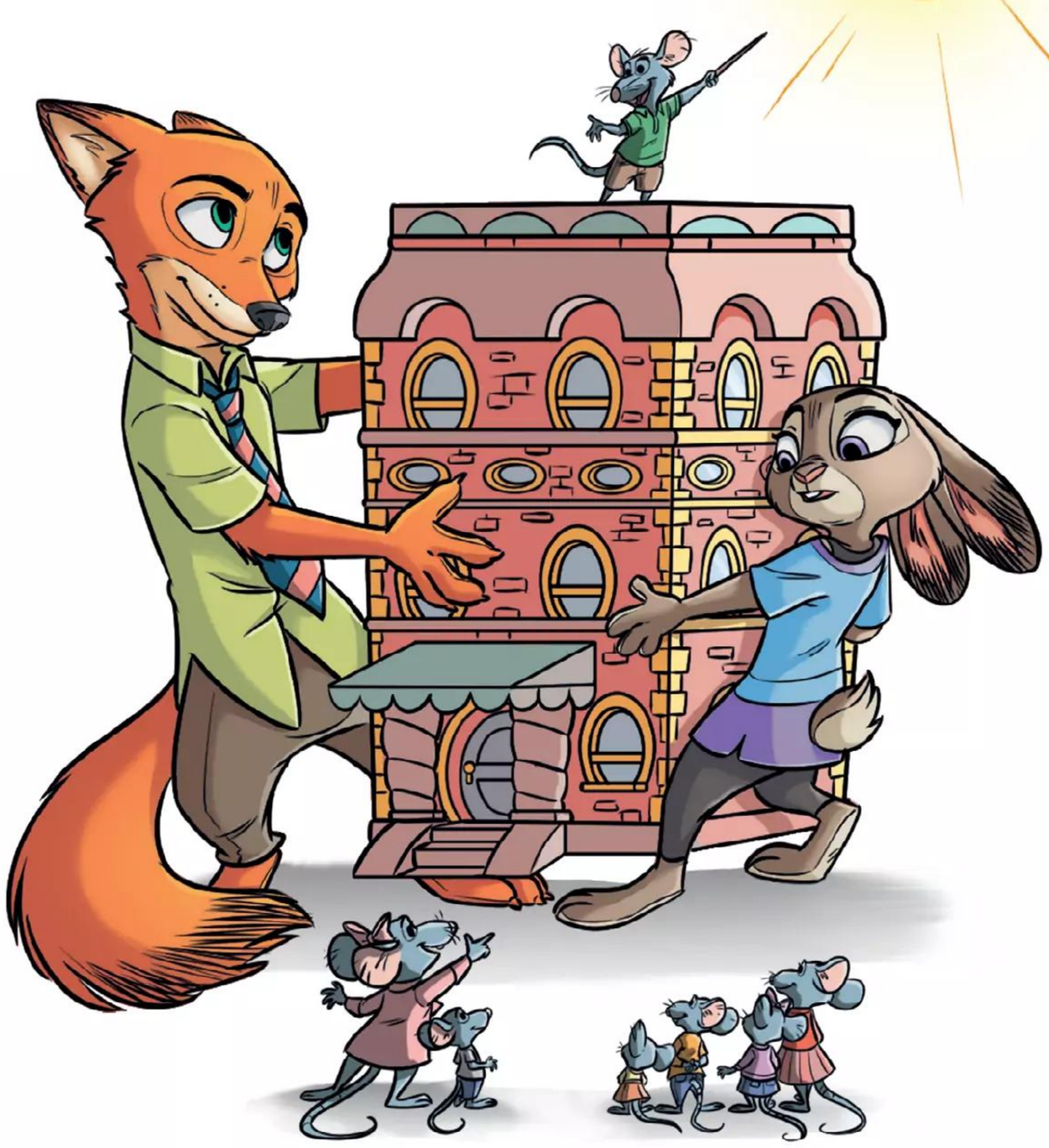
Passive strategies

WHERE AND HOW TO BUILD

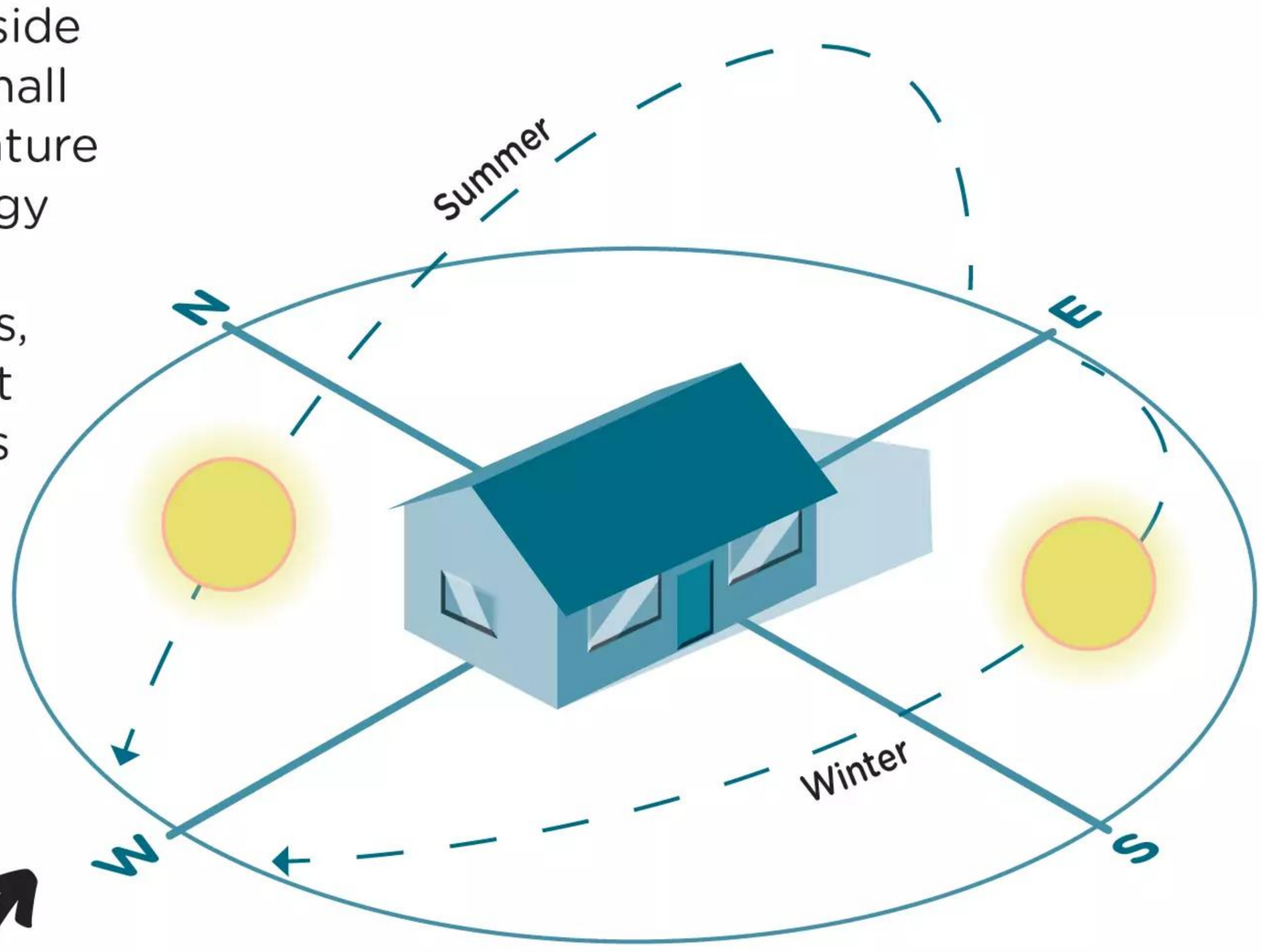
Architecture can be designed using **passive strategies**, practices that make the most of natural local conditions to maintain a comfortable temperature inside a building, thus reducing the need for electricity to power a heating or cooling system. In this way, they help reduce pollution and so are a good example of sustainable architecture.

Passive design strategies are planned taking into account the specific location and its climate. Attention must be paid to the **orientation of the building**, meaning its position in relation to the sun. In hot places, for example, it's best to construct buildings with few rooms on the south side, which is the sunniest part, while it is better to do the opposite in temperate climates. In any case, it is advisable to have as few, and as small, windows as possible, because it's through windows that heat passes most readily from the outside to the inside. Thus, having few, small windows allows the inner temperature to be kept cool and reduces energy consumption. Indeed, cooling machines, such as air conditioners, are used less when the house isn't as hot, resulting in energy savings and less environmental pollution.

But that's not all. The **shape of buildings** can also help. Basically, the fewer surfaces



and corners they have, the less buildings are exposed to wind and air penetration. What's more, compact shapes prevent heat loss, so the best solutions are dome-shaped and cube-shaped houses.



In order to take full advantage of the sun's heat in temperate climates, houses should be oriented east-west.

Local and natural

VERNACULAR ARCHITECTURE

Vernacular architecture is a type of traditional construction that uses locally available and natural materials, such as **earth, stone, wood, bamboo, or straw**. It is closely influenced by the specific local conditions, including climate, vegetation, landscape, and culture, and is increasingly used today in contemporary architecture. Scientists are studying how to make the most of it, as vernacular architecture buildings are very sustainable. For instance, the materials are available in the local area, so they don't need to be transported for long journeys, and are easily recyclable. What's more, the buildings don't need to use energy for heating or cooling, as the temperature inside them is regulated by the natural materials' insulating properties. In the Arctic, for example, the Inuit build their traditional dome-shaped hunting shelters, called igloos, using snow, and a fire inside the igloo is sufficient to keep its occupants warm.

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Wind towers are traditional architectural elements typical of Western Asia and North Africa. They are made of clay and used to create ventilation and passive cooling in buildings.

GRASS ROOFS

Energy consumption can also be reduced, for instance, by using natural materials instead of artificial ones like concrete to cover the roofs and walls of buildings. Roofs can be covered with earth and plants, for example, because both provide better insulation than concrete from heat and cold. What's more, they also absorb rain, noise, and pollution produced by home heating systems or by traffic. A popular solution is to grow a **roof garden**, which can be used by the residents as a precious open-air relaxing area.

The importance of soil

EVEN SOIL IS CONSUMED!

Even when a building is made sustainably, some **soil** is consumed. Soil is the **loose natural material** covering Earth's surface before it is touched by humans, such as the ground of the grasslands, the earth of the forest floor, and the sand along the coasts. It is very important because it provides **resources and raw materials**: the nutrients it contains are essential for growing plants for food, trees for timber, and pastures for livestock. Plus it also **regulates water**. Indeed, when it rains a lot, the soil absorbs and filters much of the water, preventing natural disasters like floods. What's more, the soil is fundamental for Earth's health because it's the environment with the highest rate of **biodiversity**—the variety of species and habitats—in the world. Just a teaspoon of soil contains a large variety of organisms, such as insects, fungi, and bacteria, which all live close together.

Every time a building or a road is constructed, the soil is **covered with concrete** or other materials and is no longer able to absorb the rain. As a result, it no longer produces resources and **loses its natural functions**. This is why it is better to renovate old buildings instead of constructing new ones, thus covering more soil with concrete.

Even after destroying old buildings and reclaiming the land they used to cover, it takes the soil a long time to return to its natural, origin state.

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WILD CHASE!

Are you seriously telling me that Weaselton told you to try **here**?

More **mumbled** than **told**, but yes. Though pretty reluctantly, Duke's exact words were...

... try the old city landfill!

POLICE

I thought this place was abandoned years ago.

It was! But as soon as the new mayor took office, she decided that a lot of the material left here could be reused!

After all, this place is overflowing with materials like **iron**, **copper**, **plastics**, and **plaster**... which can be recovered and used in new ways!

So, these people are... **separating and dismantling** the waste so the raw materials can be extracted?

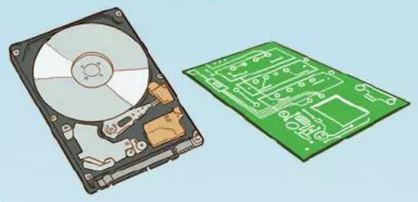
Yeah! I think they call it "**urban mining**"! Fitting, right?

Nick! Look down there!

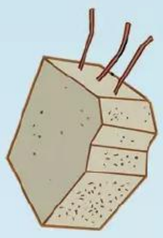
In **URBAN MINING**, the raw materials contained in the scrap are already refined and easier to reuse!

From **discarded batteries** you can get: lithium, nickel, cobalt.

From **old computer components**: copper, iron, tin, zinc, aluminum, lead (plus silver, gold and platinum!)



Old concrete: this can be ground into powder and used again.



I recognize him: he's one of the three lowlifes from the dump truck! I had a feeling they came from Zootopia!

What do we do now?

I say we tail him! Maybe we'll find out what he and his accomplices are up to in Bunnyburrow!

Copy that, Carrots! Time to go into stealth mode!

We mustn't tip him off! Let's try to stay well hidden and not be noticed.

Come on, Carrots! You know being stealthy is a specialty of foxes, right?

KLANKA-KLAMP!

VARROOONNK

I almost lost my tail!

Not to mention our stealth mode!

Gulp!

Gulp!

POLICE

He's seen us! He's getting away!

Stop! We have a lot of questions for y–

It's those party poopers from the other night!

BARRUMMPP

Hang on, Rings! I'll stop them!

ROAAAR

What...?

It's the truck!

No way! They're not getting away with it this time!

They're really starting to ruffle my fur!

Hahaha! We showed those two cops!

I'd hold off on your victory dance, Dottie.

Huuuuh?!

These guys are hard-core, Dottie! They **don't quit!**

Yahoooo! Keep it up! We're catching up to them, Nick!

This is definitely the most **unusual** vehicle I've ever **used!**

We'll see about that!

SKWEEEE

Turn left, Nick!

Oops! I don't think I can!

BUMP

Don't worry about me, Carrots! Get those twoooooooooo!

Ha, ha! One down!

But that bunny just won't quit!

Puff! Stop, in the name of the Puff! law!

Whoops! How do I stop now?

Ha! Bon voyage, bunny!

BUMP

HEY!

SCREEECH!

Need a ride, miss?

TUMP

POLICE

Five seconds later...

VROOHARR

POLICE

Talk about a last-minute rescue!

Luckily, I landed right next to our squad car... Now, let's get them!

We meet again, **illegal dumpers!**

Not for long, **flatpaws!**

POLICE

SCREEEEEECH

KLANNGG!

What now?

Aw, shucks!

They've trapped us with a **scrap magnet!**

Haw haw! I got the two meddlers, Dottie!

Well done, Stripe! Now **get rid of them!**

Uh-oh!

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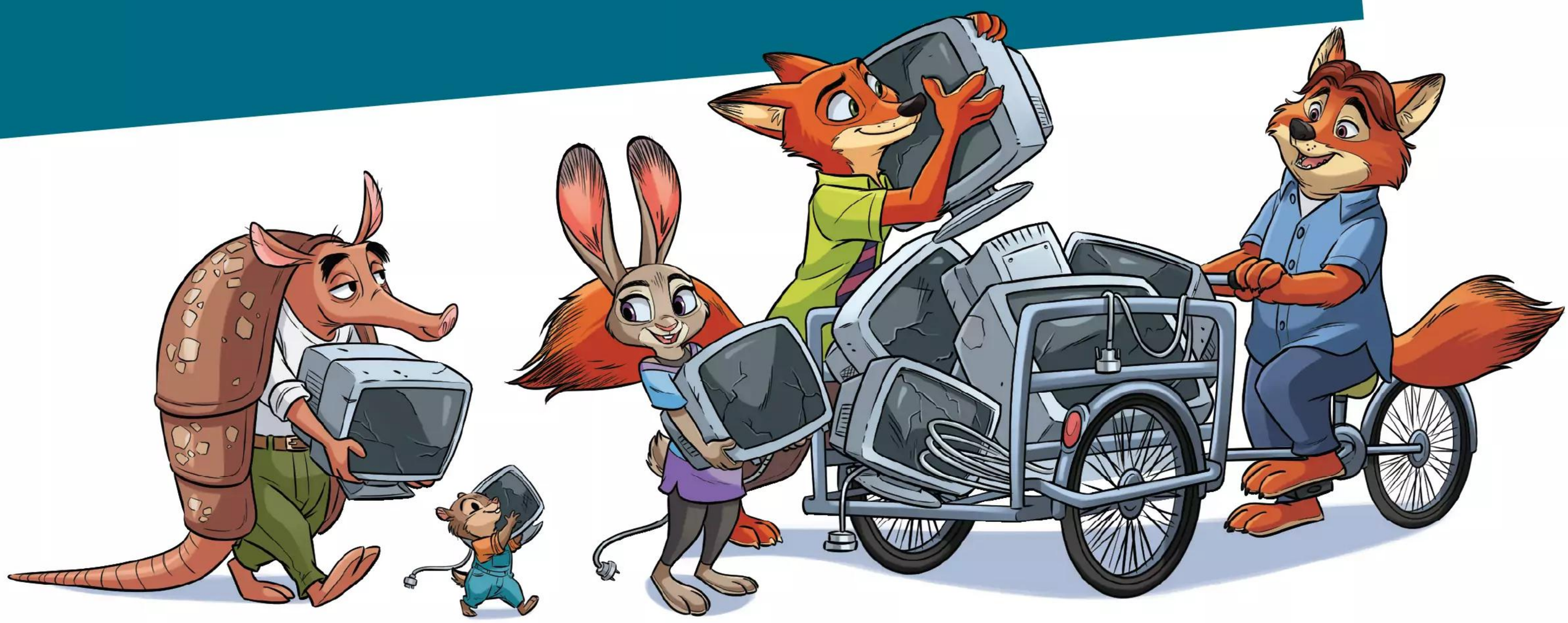
MATERIALS AND TECHNOLOGY

- Alternative materials
- The environmental cost of technology
- The technological life
- Mines in cities



Alternative materials

MATERIALS OF THE PAST AND PRESENT

For thousands of years, people have used **natural materials**, like wood, and natural fibers, such as cotton. Then new discoveries in the field of materials allowed the spread of **artificial** ones, which are created by humans using natural raw resources. One of the most important is **concrete**, made by finely grinding two types of rock, limestone and clay, and adding water. After it dries, it sets as hard as stone! Another very widely used artificial material is **plastic**, created around 1970 from **petroleum**, a dark, dense liquid extracted from the ground. A few decades later, **silicon**, a natural material found in rocks, became one of the most important materials of our time, as a key component of computers and all electronic devices, including TVs and smartphones.

Early people used the resources offered by nature, such as rocks, wood, and animal furs.

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The environmental cost of technology

SMARTPHONE MATERIALS

Till the end of the 20th century, **telephone calls** were made using a device with a cable connected to a plug in the wall. Then **cell phones** were invented, making it possible to place calls wirelessly for the first time! Cell phones gradually became very widespread, and the number of things they could do, that is, their functions, steadily increased. More recently, the **smartphone**, an upgraded model of the cell phone, was invented. This is a multifunction cell phone used to make phone calls, take photographs, and do many other things. However, smartphones don't differ from the landline phone just in their functions but also in **the number of raw materials** needed to make them. Indeed, while the landline required about 12, a smartphone uses around 50!

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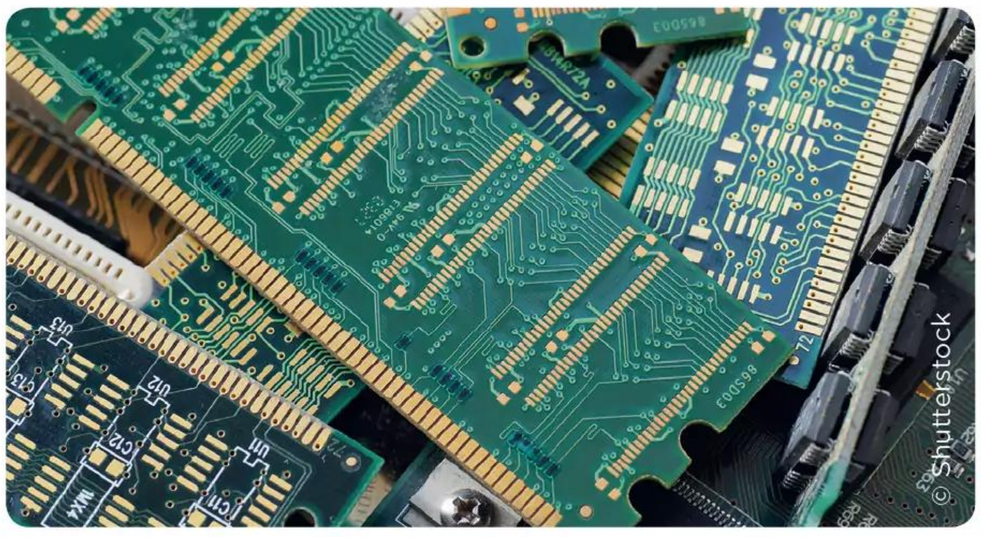
Some of the many raw materials contained in smartphones are very polluting and toxic. For example, cadmium, which isn't just bad for the environment but can also potentially hurt humans by weakening their bones.

ENVIRONMENTAL WEIGHT

A smartphone weighs about 200 grams. However, in addition to its physical weight, it also has an **environmental weight**, meaning the **weight of the raw materials** used to produce it, which is over 80 kilos! A finished smartphone is so much lighter because all the stones and gravel mined in order to extract the raw materials, chemicals, and water used for its manufacturing, are discarded. Then, the **discarded materials become waste** that must be disposed of correctly, otherwise it can cause severe pollution. And because there are so many objects produced using multiple materials, their environmental weight is huge. One way of reducing it is to limit constant production of these objects by using them for **as long as possible** before replacing them..



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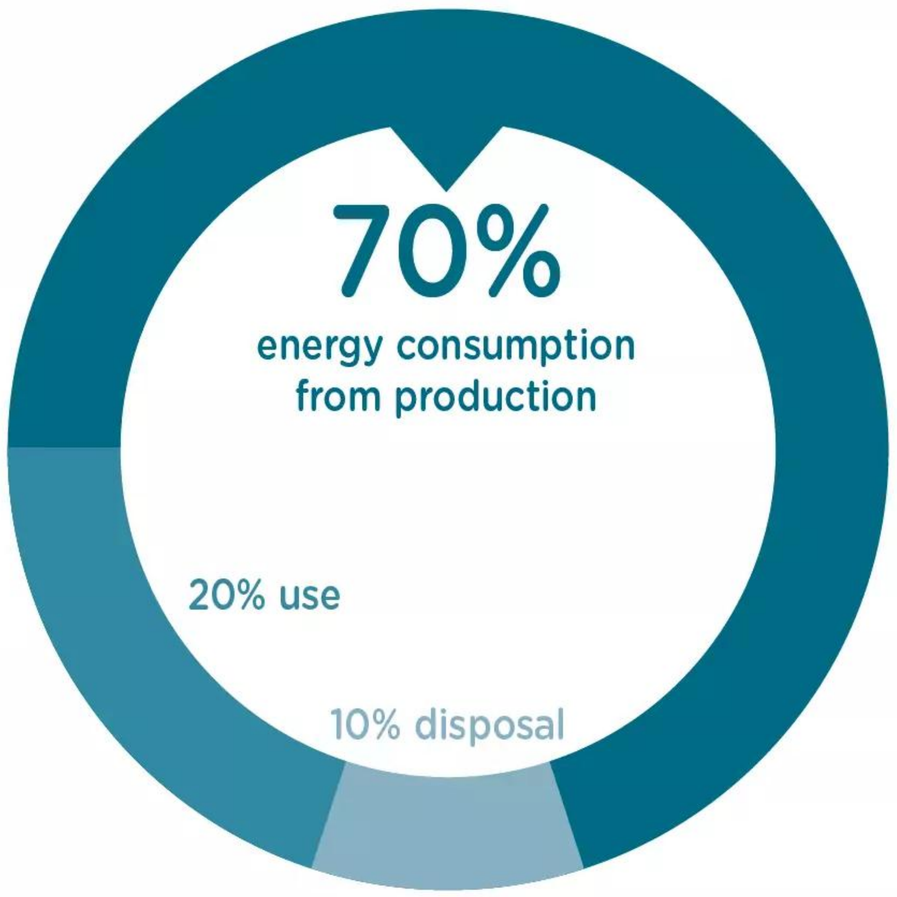
Recycling electronic devices allows the precious components they're made of, like gold and silver, to be recovered.

The technological life

HOW MUCH ENERGY DOES IT COST?

Today, almost everyone uses technological devices such as computers, tablets, and smartphones. Each of these objects has a **life cycle** that starts when the materials needed to make it are gathered and put together.. It continues while the object is used and ends when it is thrown away and the materials that compose it are disposed of. Each of these steps uses some energy to be completed, and **most of this energy is consumed before** the technological device (a tablet, for example) arrives at the store where it will be sold. That is because over 70% of the total energy used in the average life cycle of a device is used in its production! And only 20% is consumed by the person who buys the device.



Only 10% of the total energy involved in the life of a technological device is used in its disposal, while the majority is used to produce and assemble it.

BUILT TO FAIL

Today, most electronic devices are **built to fail**. This is called **planned obsolescence**, meaning that devices like televisions and laptops are manufactured in such a way that they stop working within a certain period of time so that people are forced to buy new ones to replace them. This is sometimes achieved by using **low-quality materials** or by ensuring that repairs for breakages are too complicated and expensive. As a result, the average service life of mobile phones is less than two years, even if they could potentially function for much longer. Something similar often happens in the fashion industry too: clothes are made with cheap fabric to keep the prices low, but this also means that they wear out quickly and need to be replaced within a short time.

Mines in cities

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Urban mining doesn't just take place in recycling centers, but also in unsorted-waste landfill sites, which can be another important source to recover precious raw materials.

URBAN MINING

When electronic devices are thrown away, they end up at recycling centers. As in the case of many other objects, their reusable components are salvaged there. This process is called **urban mining**. Basically, it works a bit like a mine dug into a mountain or underground, just that in the case of urban mining, the **digging takes place in the city among the refuse**.

All sorts of things can be salvaged through urban mining. For example, materials for new buildings can be recovered from the remains of a demolished house, and as we have seen **precious raw materials**, like cobalt, gold, and silver, can be found in many electronic devices, like smartphones. These devices can be taken apart to recover the internal components and the different raw materials they're made of, like silicon, copper and iron. These raw materials are **96% recyclable**, meaning they can be treated so that they can be reused to make other electronic devices. Consequently, there is less need to search for new raw materials, with the result that **energy is saved** and the environment polluted less!

WHAT LIES BENEATH

KA-CHAKK

Haw haw haw! Happy landings, cops!

Let's get out of here, Judy!

SSSKLANG

OOF!

We made it, just in time!

Unfortunately, they made it, too: they got away! And our car is almost totally wrecked.

It's not over yet!

So long, losers!

How are we going to chase them?

Like this!

Stop! ZPD!

SSKREEEEE

Hey, whaddaya know! It's our Flash!

To what... do I owe...

... the... pleasure... Nick?

It seems like we need your help, Flash hundred-yard-dash!

There's not a moment to lose! **Follow that truck over there!**

Right... away... officer!

VROOOOMM

How can a sloth drive so fast?

Don't ask me!

We'll... catch... them... any ... minute now!

Maybe... I spoke... too... soon, Nick!

There's always a first time, my friend!

They're aiming for that big tunnel!

By the look of things, Carrots, we're going to have to continue our investigation in the **underworld**!

Among the **criminals**, you mean?

No, I mean literally **under the ground**!

We're in the **Nocturnal District!**

Zootopia's underground district? I've never been here before!

welcome to

NOCTURNAL DISTRICT

For the most part its residents are nice people, but this place is also home to some **shady characters!**

Whatever it is, I think it's a fascinating place!

In its own way, it sure is!

An underground city has some of advantages.

Such as?

Well, for a start, living in rock cavities offers good protection from excessive changes in external temperatures!

How so?

In fact, the temperature down here is **stable**. This is because when it's **hot** on the surface, the rocks **store heat**, and they slowly release it in the evening, when temperatures are cooler.

On the contrary, when it's **chilly outside**, the rocks provide **insulation** from the cold. This also saves energy, as neither artificial cooling nor heating is required!

What's more, the **water's better** underground too, because the water in the subsoil hasn't been contaminated by the dirty surface water!

Now that I think about it, an underground district has no impact on the **landscape** above ground.

Not to mention the fact that this environment is insulated from the noise of the world above!

That's true! I think I'd miss the sunlight if I lived here, though...

SKREEEEEEKK!

OUCH! Easy on the brakes, buddy!

Flash! What... ?

I'd say... that's... the... truck...

SKUNKINGTON

Gasp!

That's the same truck we were following!

... we... were... following!

You're a real champ, Flash! See ya, buddy!

This time we have them in the palm of our paw!

Not these guys again!

I'll call for backup!

We have a lot of questions for you!

And you'd better answer right here and now!

Suuure!

Haw!

Lemme guess: Fluffytail here is gonna be the good cop, and the fox will be the bad one?

Heh, you wish.

You got it backwards! **I'm** the cop you don't want to upset here, and you better start telling me what we want to know!

WHOOP WHOOOP

Starting with: who gave you permission to dump toxic waste in the countryside?

So what's going on here?

Officers **Van Veldt and Packimpah**, these three villains are under arrest for **illicit activities** and **resisting arrest by a police officer!**

There must be some mistake, officers! We're honest employees with a regular license to transport and dispose of construction debris, on behalf of the **Skunkington Disposal Company!**

Hmm! Everything does seem to be in order.

It isn't! Why was their dump truck empty at the landfill, in that case?

Well, duh! That's what a dump truck does, honey! We **dumped** everything in it already!

You sure did... into Bunnyburrow's river, to be precise!

Errm, Carrots... ?

Ahem! Did someone mention me?

Oh, no! Not **him!**

Allow me to introduce myself: I'm Theodore Skunkington.

What seems to be the problem, officers?

CONTINUES ON PAGE 107

LIVING IN THE FUTURE

- A new kind of urban planning
- How and where to build
- The 15-Minute City
- Repopulating the countryside

A new kind of urban planning

HOW CITIES CHANGE

Urban planning is the process of designing **cities** and places where people live. For decades, urban planners have made cities larger and larger as more and more people have come to live in them. However, by **organizing the space better**, it's possible to house more people without increasing land use. Indeed, cities and neighborhoods can be designed to make the most of the areas they occupy by renovating and **reusing abandoned buildings**; by planning an efficient use of existing spaces creating the optimal balance between people occupancy and energy used to maintain them; or by constructing **smaller new homes**.

At the beginning of the 19th century, only 5 out of every 100 people lived in a city, while today the figure is 55 out of every 100, and it's increasing every year.

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How and where to build

SMALLER HOUSES

Space can be reclaimed by building houses or common areas in existing **urban gaps** in cities, such as underused spaces, courtyards between buildings, and flat garage roofs. These sites are too small to build large buildings, yet big enough for small houses. For example, thirty-seven square meters can be enough to provide the necessary space, air, and light for two people. These are called **tiny houses** and are an example of **sustainable architecture** that allows abandoned urban spaces

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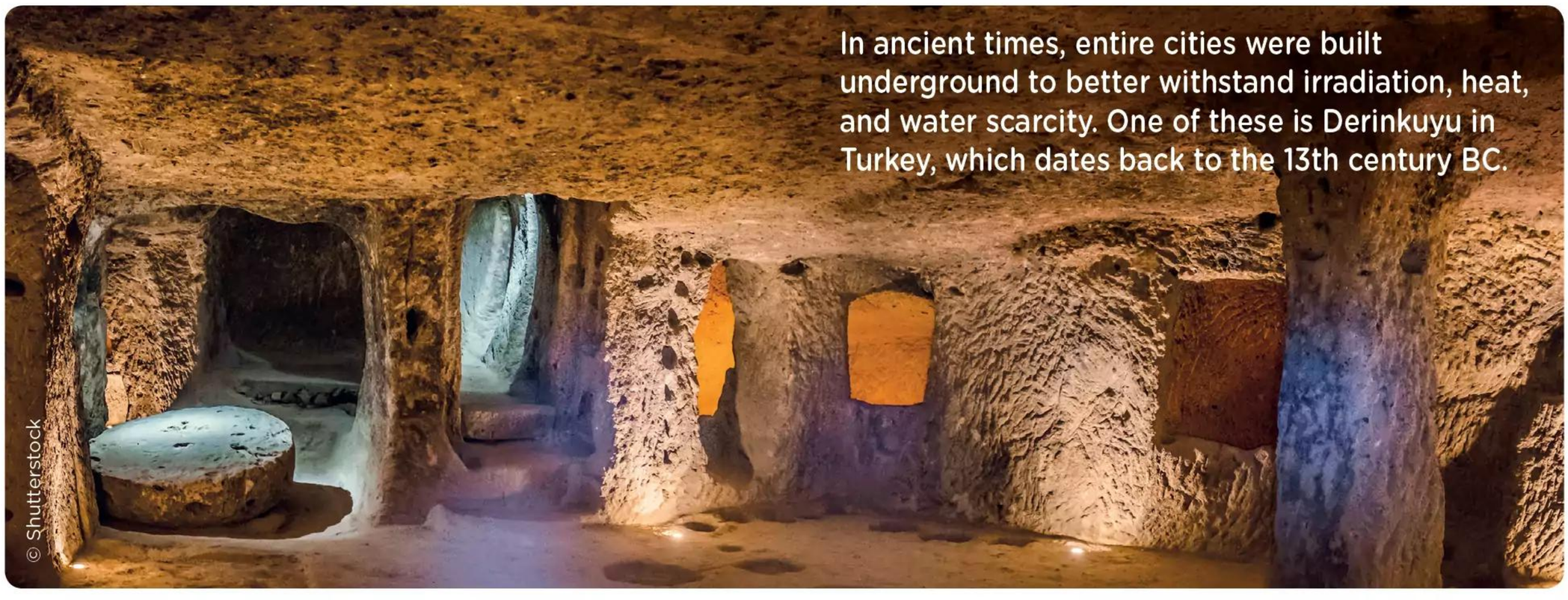
By better organizing the space, tiny houses condense all the elements of a traditional house in a much smaller area.

to be used. Such innovative approach uses no new soil, but must be planned carefully in order to maintain a proper space for the community life and avoid overbuilding.

UNDERGROUND CITIES

Another way of building that has recently been explored is to construct buildings or small parts of cities underground, as in the past. While it requires careful analysis of the land before choosing the most appropriate building sites, there are benefits to underground construction: it **doesn't alter the landscape** on the surface, and it provides natural protection from the weather and insulation from extreme temperatures. This is really important if you live in very cold or hot habitats, like near the desert. Underground construction also **saves** costs on **maintenance**, that is the work required to keep a building in good repair: Historically, underground facilities have experienced a **lower rate of damage** than surface structures, for example from weather phenomena like storms and geological events like earthquakes.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In ancient times, entire cities were built underground to better withstand irradiation, heat, and water scarcity. One of these is Derinkuyu in Turkey, which dates back to the 13th century BC.

The 15-Minute City

EVERYTHING CLOSE TOGETHER

Today, designing cities also means building houses that are never too far from the services that people need in order to live well. These include schools, sports centers, hospitals, stores, and cultural spaces such as theaters, movie theaters, and museums. The concept of the **15-Minute City** is an example of this. It's a way of reorganizing the city and its spaces to enable citizens to have everything they need **within 15 minutes (on foot or by bicycle)** of where they live. This means citizens are able to reduce the use of cars and public transport, **decreasing traffic and air pollution**, and spend less time traveling. Rather than commuting for several hours a day, they can use this time for leisure activities and to see family and friends. And with more services available on their doorstep, even in really peripheral neighborhoods, residents are more likely to want to spend their free time discovering and enjoying their local area, for example, taking part in activities held locally, as well as getting to know other inhabitants and thus making new friends nearby. The high accessibility of everything in a short distance and in a short time is one of the reasons why the 15-Minute City has been called the **proximity city**, referring to the closeness of all its facilities and services.

The 15-Minute City has wide sidewalks and more pedestrian areas and cycle lanes than other cities, allowing pedestrians and cyclists to get around more easily.

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Repopulating the countryside

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→ The Internet allows "remote work," where people can work from anywhere rather than in their offices.

NOT JUST CITIES

New developments in the homes of the future don't just concern urban areas but also the areas outside the cities, such as small towns and **villages** in the **countryside, mountains, and valleys**. In the past, villages far from cities were often abandoned, mainly because they offered few work opportunities. Now, however, people are returning to live in them due to their more sustainable environments or the development of certain economic activities, such as **tourism** or **agriculture**. The more people move back to villages, the more new jobs can be created there, namely on farms, but also in stores, restaurants, museums, and art venues, like historical buildings and churches. Over the years, new technological inventions have also made living outside the city much easier. Take the Internet, for instance: by connecting people all around the world, and enabling them to share information with each other, this digital network has made it simple for people far away from the cities to stay informed about everything and keep in contact with everyone. However, in order for them to continue to develop, it is important that small towns and villages offer their inhabitants what they need. Consequently, in addition to **essential services** like hospitals and schools, there must also be **job and leisure opportunities** for those who are born there and for people wishing to move from the cities to these smaller communities.

THE TRAIL GOES COLD

Well, sir, it appears that you are suspected of illegal dumping in a river outside the city.

Come on, officers, there's **obviously** been a mistake!

I've worked in disposal for years, and **no one** has ever had a problem!

I have a problem here--

=HMMPH!=

Better let it go, Judy!

I'm afraid that in their commendable desire to **protect and serve** the citizens, your colleagues have been a little overzealous!

But I want to believe that this misstep is only the result of their inexperience, and I forgive the ZPD for this embarrassing misunderstanding!

Hmm... There's no evidence against you and your employees, Mr. Skunkington. You are all free to go.

And **you two** had better come back to the station with us!

And there...

A squad car destroyed during an unauthorized investigation?!

And what's more, now I'm also hearing about accusations against a private citizen, without a shred of evidence?

Uh... Ah...

Didn't I tell you to **DROP** this case?

Errr... Yes, but...

I won't tolerate any more insubordination from the two of you! Since you're incapable of staying out of trouble, you are suspended from service until further notice! **Get out!**

Right when we have **a name** finally!

And not just any name, Carrots! Remember when I told you about **shady characters?**

Well, Theodore Skunkington **is one of them!**

You don't mean...

He may seem like a respectable waste disposal entrepreneur now, but in the underworld everyone knows he once specialized in "disposing" of inconvenient evidence and witnesses!

Are you **sure**?

Of course! He was none other than **Mr. Big's business partner!**

You don't say!

Shortly after...

I have to say you're taking our suspension surprisingly well, Carrots. But I don't understand what we're waiting for, standing here.

We can't use a ZPD vehicle anymore, Nick.

KONGA WARREN
BIG HAKUNA
BUG BURGERS
UPGRADE YOUR LIFE!
GO TO EVOLVILLE
SHREWRATON HOTEL
NEW DISTRICT,
NEW PERSPECTIVE

But we can't **give up our investigation** either, right?

You know me so well!

I'd meant to scare you into some sense, but it seems I just had the opposite effect!

Don't you always?

And here comes our ride!

Hey! Isn't that a...

A carpooling service? Yes, yes, it is!

Welcome on board, you two! Hop in!

And **this** was your solution? Couldn't we have rented a car?

Actually, carpooling is a **much cheaper** way of moving around the city, since a group of you travel together in a single car that goes in a **shared direction**.

So the costs are split between everyone!

And this way, it's **much less polluting** than using a car each!

It's also a nice **fuel saver!**

Saver? **Pah!**

As if it could make a difference...

... when Zootopia uses **huge amounts of energy** to maintain **different climates** in its districts!

FWOOSHH

In any case, it's an opportunity to make **new acquaintances!**

Very true!

Agreed!

Sure!

New acquaintances, huh?

But now an **old acquaintance** awaits us!

You said it yourself: Skunkington knew the boss of **Tundratown!**

DING DONG!

And...

It's a pleasure to see you again!

Meh... Likewise...

Say hi to your godmother, **little Judy!**

Hi, Aunt Judy!

My, how you've grown!

Meh. To what do I owe the pleasure of your visit, Miss Hopps... and Nick?

You see, Mr. Big, sir... we have a few questions about your... errr... old business partner.

Theodore Skunkington, you know?

Him, huh? Meh...

Yes, I was in "business" with him, years ago.

But then I broke off our partnership. He had too **few scruples for my liking!** His methods were, let's say... **unethical!**

And if **he's** saying that...

It was also because of him that I decided to throw myself into a completely different activity: limousine rental! It gives me much more satisfaction.

Especially since I manage everything here from my desk, thanks to **teleworking!**

DA-DA-DING-DA-DING-DING

Tee-hee! Only because **I convinced you** to modernize, Daddy!

I would stay away from someone like him, if I were you! Especially now that he's got his claws into a building operation just outta town.

Great advice, Mr. Big. Although at the moment we couldn't get close to Skunkington even if we wanted to.

Nick! A call from the ZPD!

Looks like we've just been **reinstated!**

CONTINUES ON PAGE 119

GETTING AROUND TODAY

- Private transport
- Public transport and car sharing
- Electric cars and batteries
- Bicycles

Private transport

On average, a person who uses their own car to get around the city spends seven years of their life behind the wheel!

FEWER CARS AROUND

The invention of the **car** has allowed longer distances to be covered in less time than in the past, when people traveled on foot or, at best, by horse. However, in many countries today the number of private cars, those owned by individuals, is one for every two inhabitants! And it is often the case that these cars carry only one person, or at most two people at a time. This causes more **air pollution** and increases **traffic** that, in turn, costs each traveler **more time** spent moving around. That's why, today and in the future, it is important to reduce the number of vehicles on the road by using **alternatives** to cars for getting around.

Public transport and car sharing

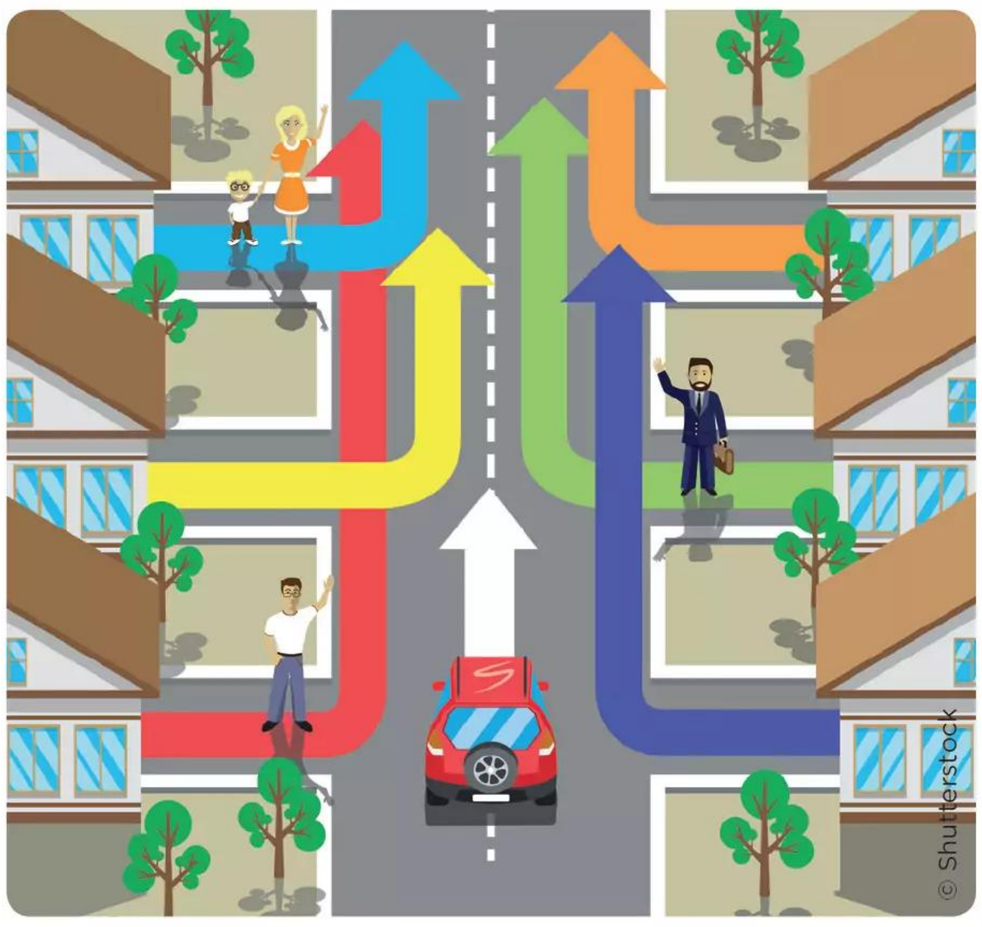
DRIVERLESS VEHICLES

One alternative to the use of private cars is **public transport**, like buses, the subway, and trams, because they can carry many passengers and may also be easily powered by electrical energy, which doesn't pollute. Some public transport vehicles are **self-driving**, meaning they don't have a human driver. Driverless trains and subways are relatively simple to create, because their path is confined to their own rail network and the train operator doesn't need to worry about other trains weaving in and out of its path. Self-driving cars, on the other hand, require complex softwares and sensors and a skillful understanding of traffic conditions, safety norms, and human psychology. So, while they already exist, it will still take some time for them to become common on our roads.

Some taxi companies already include driverless cars in their fleet. Their computers put together all the passengers' requests and work out the best route to take.

CAR SHARING AND CARPOOLING

Another alternative is to use a **shared** car. When someone needs a car, they rent it for a short period and pay only for the time they use it, then they leave it for somebody else to rent. This is called **car sharing**. Shared cars may be public, meaning that they're **available to everyone**, both residents and tourists. Or they may belong to people who don't use them much and want to lend them to others when they don't need them.



Then there's **carpooling**, where a car is used by **multiple people at the same time**. In fact, when the owner of a car needs to go to a certain place, they make the extra spaces in the car available to people who want to make the **same journey**. So it's possible to reduce pollution while traveling in a group!

Carpooling is ideal for people who make the same journey at the same time, like coworkers or classmates.

Electric cars and batteries

THE FUTURE IS ELECTRIC

Nowadays, people who want to buy a new car can choose one with an **electric motor**. Electric cars **create much less pollution**, and they're very **quiet**. They use a rechargeable **battery**—like that of a tablet, a smartphone, or other devices—which is designed to supply an amount of power suitable for urban journeys. These are usually short trips of no more than a hundred kilometers or so, after which the battery must be recharged. Electric charging stations are used for that purpose. They look like **columns** and are located in various places around the city, available to those who need them. But the battery can also be charged by connecting the car to a special socket that you can install in your garage at home, just like any other device that needs charging!

However, this type of battery may not always be enough, especially for people who make long journeys outside the city. That's why there are also **hybrid cars** that combine an electric motor with a combustion engine, which is powered by fuels like gasoline, diesel, or natural gas.

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The advantage of this type of car is that the combustion engine generates energy to power the electric battery so that the driver doesn't need to stop and recharge it. So you can use the combustion engine when you want to go faster, for example, outside the city, and the electric motor when you're driving slowly, in city centers, for instance.

To avoid creating pollution, electric cars should be charged using renewable sources, like solar energy, as opposed to energy from fossil fuels.

Bicycles

LET'S GET PEDALING!

Bicycles are another alternative to private cars. Indeed, according to scientists, the traditional two-wheeled means of transport has many important **advantages**. First of all, cycling helps improve physical health, due to the exercise gained by pedaling. Twenty or thirty minutes a day are enough to have a positive impact on the body. But that's not all. While riding a bicycle is an activity that can be done alone, it can also be done with friends and other people who share the same hobby, improving in that way people's social life. There's more though: getting around on two wheels is also **economical and causes less pollution**. A car not only needs fuel or electrical energy to move, but also larger roads and parking lots that consume natural land. What's more, a bicycle is easier to repair than a car, and it's also easier to check that all its parts (such as the brakes) are in good working order. Finally, it has been found that riding a bike to school, for instance, can help students' **ability to concentrate**, and being more focused helps them learn faster. Due to all these reasons, many countries encourage the use of bikes in daily life by creating urban **cycle lanes** and placing bike racks on sidewalks for cyclists to park.

Bicycles can be used by people of all ages. You just need to wear a helmet and know the rules of the road.

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